* NOTICES *

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CLAIMS

[Claim(s)]
1. Electric Starter (4);
Electric short-time are recording equipment used for electric supply of a starter (4) after charge (8)
It is especially capacitor are recording equipment.;
Direct or indirect temperature detection means;
Control unit (13) which makes a part of drawing of the energy accumulated in short-time are recording equipment carry out to temperature relating with the amount of ejection smaller than the case where temperature is high when especially temperature is low in order to supply before a starting process at one or more loads (1);
Starter system for the internal combustion engine (1) which ****.
2. Starter system according to claim 1 whose loads (11) are electric heater, especially catalyst heater.

3. Electric Starter (4);
Electric short-time are recording equipment used for electric supply of a starter (4) after charge (8)
It is especially capacitor are recording equipment.;
Electric long duration are recording equipment (10);
It is a controllable coupling circuit (7c) about the energy which makes it possible to take out energy from short-time are recording equipment (8) and long duration are recording equipment (10) to coincidence in the case of starting, and is taken out from either or the both sides of long duration are recording equipment (10) and short-time are recording equipment (8) in that case, or its part.;
Starter system for an internal combustion engine (1) which ****.
4. It is the starter system according to claim 3 with which only the output of the amount needed for starting after making the output of short-time are recording equipment (8) emit to max is taken out from long duration are recording equipment (10).
5. It is the starter system according to claim 3 with which only the output of the amount needed for starting after making the output of long duration are recording equipment (10) emit to max is taken out from short-time are recording equipment (8).
6. From long duration are recording equipment (10), it is starter system given in any 1 term of claims 3-5 from which the output or its predetermined part in which max is possible is taken out in the optimal adaptation.
7. For long duration are recording equipment (10), short-time are recording equipment (8) is starter system given in any 1 different term of claims 3-6 in which it operates with the higher electrical-potential-difference level, and a coupling circuit (7c) has a converter especially.
8. Starter system given in any 1 term of claims 1-7 by which electric power is supplied to starter from inverter (7) which has direct-current-voltage intermediate circuit (7b), and short-time are recording equipment (8) is formed in direct-current-voltage intermediate circuit (7b).
9. It Has the Following Step. : By Taking Out Energy from Long Duration Are Recording Equipment (10), Short-time Are Recording Equipment (8) is Charged.;
The amount of energy required in order to start an internal combustion engine (1) is calculated.;
Based on a starting command, the part which is accumulated and is not needed for starting of energy is taken out, and the energy is supplied to one or more loads (11).;
The energy component which remains to short-time are recording equipment (8) is used, and an

internal combustion engine (1) is started.;
How to start an internal combustion engine (1).
10. It Has the Following Step. : By Taking Out Energy from Long Duration Are Recording Equipment (10) Slowly, Short-time Are Recording Equipment (8) is Charged.;
By taking out energy from short-time are recording equipment (8) and long duration are recording equipment (10) to coincidence, it is controllable in the energy component which is made to put an internal combustion engine (1) into operation, and is taken out from long duration are recording equipment (10) and/or short-time are recording equipment (8) in that case.;
How to start an internal combustion engine (1).

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
How to make the starter system list for internal combustion engines put an internal combustion engine into operation This invention relates to the approach of making the starter system list for internal combustion engines putting an internal combustion engine into operation.
It is known that an internal combustion engine can be started using a capacitor. In that case, energy required for starting is made a higher electrical-potential-difference level by the direct-current-voltage-direct-current-voltage transducer (the so-called step up converter) which steps up from car (it has 12-volt or 24 volts) electric system, and is accumulated in one or more capacitors. This kind of starter system is known by for example, the SU1265388A1 (MOSC AUTOMECH) list from EP 0390398A1 (ISUZU). In the case of a comparatively easy system, capacitor are recording equipment is in the same electrical-potential-difference level as a car dc-battery, therefore a step up converter does not intervene here. The example is acquired from US-PS5041776 (ISUZU) by DE4135025A1 (MAGNETI MARELLI) list. In all the systems mentioned above, the dc-battery is separated from the starter motor between starting processes, therefore starting is performed by the energy completely accumulated in capacitor are recording equipment.
In the case of the easy system (with no step up converter) of the class mentioned to the 2nd, further, in case the capacitor beforehand charged with the dc-battery in JP02175350A (ISUZU) and JP02175351A (ISUZU) is starting, it connects with juxtaposition, and it is proposed that two energy storage devices contribute to a starting process by it.
It is known that it is related to the temperature of an engine-coolant means by which charge the capacitor used in order to accumulate starting energy further from EP 0403051A1 (ISUZU) only to an adjustable predetermined voltage level, but the voltage level exists, respectively.
There is a proposal used as are recording equipment for the energy needed by the electric heater since it is other use besides the above-mentioned proposal about using a capacitor as are recording equipment of starting energy. That is, a catalyst heater with electric EP 0533037B1 (MAGNETI MARELLI) and glow equipment with EP 0420379B1 electric [for a diesel power plant] are indicated, and heating energy is prepared in capacitor are recording equipment in that case, respectively.
And from WO 93/11003 (BOSCH) and EP 0688698A2 (others [BMW]), although it charges in common, respectively, in the case of starting, the vehicular power supply system which has the starter dc-battery separated and a car electric system dc-battery is known. In the official report mentioned at the end, two dc-batteries are connected through the control unit which controls a charge process.
Especially, even when very cold, the well-known starter system which has capacitor are recording equipment guarantees more positive starting, and seldom fits short-time charge in the case of starting in itself [-]. - It makes it possible to design the conventional car dc-battery smaller.
This invention aims at offering the improved starter system which has short-time are recording equipment like for example, capacitor are recording equipment. Preparing the method for making it start of having responded to it also belongs to this invention.
According to the 1st view of this invention, the starter system for an internal combustion engine has the following.
Electric starter The electric short-time are recording equipment used for electric supply of a starter

after charge, especially capacitor are recording equipment Direct or indirect temperature detection means Control unit which takes out a part of energy accumulated in short-time are recording equipment in order to supply before a starting process at one or more loads. The control unit relates the magnitude of the energy component taken out to temperature, and when temperature is low, it is made smaller than the case of being high (claim 1).
The electric energy needed for starting when severe freezing takes place so that it may be especially -20 degrees C, when this 1st view of this invention has :internal combustion engine's low temperature based on the following recognition is much larger than the case where it is the temperature under drive, when temperature is high. This has a cause in the resistance an internal combustion engine does [resistance] antagonism to starter rotation according to the viscosity of oil which becomes large becoming large all the time, mainly when cold. Starter system must be designed so that it may operate also at the actually produced lowest temperature. That is, the capacity of a capacitor is designed remarkably excessively to the comparatively high temperature generally produced. This corresponds to the operation gestalt which must store especially all the energy that capacitor are recording equipment needs for starting. However, a part of starting energy is taken out from long duration are recording equipment, and it is applied although a part of the extent can be weakened also in the operation gestalt in which only a part is accumulated by short-time are recording equipment. In the comparatively high temperature which is produced in many cases, in order to make it not apply a burden to a capacitor with many energy rather than it is needed in starting, it has proposed that above-mentioned EP 0403051A1 (ISUZU) accumulates the amount of energy which decreases with the rise of temperature.
This invention (the 1st view) has taken other approaches to it. Are recording depending on the temperature of short-time are recording equipment is also because a dimension design must be carried out for the lowest temperature, therefore it is exactly an excessive dimension. a load besides the component which is not needed for being when the temperature in a short-time are recording equipment capacity is comparatively high (it differs from a starter) -- useful -- making -- it -- those loads -- desirable -- before an internal combustion engine's starting -- already -- a short time -- it was shown clearly that a high output could be supplied. For example, in high temperature, comparatively high energy and output value can be used before starting like drive temperature for these additional loads.
This amount also falls as an internal combustion engine's temperature decreases. It is because a large energy component must be secured for a starting process. The energy for an additional load does not remain in the lowest temperature generated depending on the dimension design of capacitor are recording equipment. When the generator which drives those electric supply with an internal combustion engine when [this] comparatively rare supplies energy, it can shift to the time amount for example, immediately after starting.
"Short-time are recording equipment" is each are recording equipment of less than 30 seconds and the electric energy which can be especially taken out within 15 seconds preferably without the damage on the great portion of maximum energy (for example, 97%) accumulated preferably less than 60 seconds. everything but a capacitor -- therefore, there are the chemical energy storage device for high output drawing, for example, the so-called alkali second-order system, for example, alkaline alkaline nickel / cadmium system, and nickel / iron system, and they can have a sintered electrode or a fiber structure electrode. It is are recording equipment which cannot take out the total energy accumulated after "prolonged are recording equipment" charges completely to it unless it spends larger time amount than 10 minutes.
a desirable heater with an electric load -- it is a catalyst heater preferably (claim 2). In order to fulfill a future severe exhaust gas convention, probably it will be necessary to already heat an exhaust gas catalyst electrically before an internal combustion engine's starting in an Otto engine. A catalyst being already in the drive temperature in the case of the first ignition by it, and operating effectively by it is attained. In other cases, when the short-time are recording equipment of an excessive dimension does not have an internal combustion engine's too low temperature, this invention makes quick preheating of a catalyst possible without actually structural added cost by being used as momentary are recording equipment for catalyst heating energy. Charging slowly from car electric system in a comparatively early driving cycle, in order to heat a catalyst, it discharges [while short-

time are recording equipment takes out a slight output from a dc-battery unlike the case where electric power is supplied from the conventional long duration dc-battery (it has the minimum charging time value longer than 30 minutes typically), or] shockingly (claim 2). Compared with the conventional lead-acid-battery, heating is an electric high output, therefore is extremely performed at a high speed within 1 second or several seconds. For example, an output desirable and high before starting can be supplied to other heaters, such as a windowpane heater.
The 2nd view of this invention is related with the starter system equipped with the following. Electric starter The electric short-time are recording equipment used for electric supply of a starter after charge, especially capacitor are recording equipment Electric long duration are recording equipment Coupling equipment which makes it possible to take out energy from short-time are recording equipment and long duration are recording equipment to coincidence in the case of starting. The coupling equipment is controllable in the energy taken out from long duration are recording equipment and/or short-time are recording equipment, and/or the component of an output (claim 3).
The idea used as the foundation of this 2nd view is not designing short-time are recording equipment in such a large dimension that an internal combustion engine's being independently started even when temperature's is low, but taking out energy from short-time are recording equipment and prolonged are recording equipment (for example, the conventional sulfuric-acid-lead accumulator) to coincidence rather. The easy parallel connection of a dc-battery and capacitor are recording equipment is known from the open Japanese official reports 02175350A (ISUZU) and 02175351A (ISUZU), as mentioned above. However, starter system is completely simple starter system in this case. The well-known system by which development progressed all the time to it has a step up converter from a dc-battery to a capacitor, and in case it is starting, both are recording equipments are separated (SU 1265388A1 (see the MOSK AUTOMECH) mentioned at the beginning). A step up converter is used in order to charge capacitor are recording equipment at the electrical-potential-difference level raised as compared with long duration are recording equipment.
(The 2nd view) a different approach is taken by carrying out also in the case of discharge between starting processes by (only) not performing this invention actively between two energy storage devices in the case of charge of controllable coupling of short-time are recording equipment. When two energy storage devices involve, while making small the dimension design of short-time are recording equipment, relative output drawing can be fitted to an especially different property of two different are recording device type. "it is actively controllable" means that that long duration are recording equipment and/or short-time are recording equipment cannot (only) be turned on and off but the energy taken out from long duration are recording equipment and/or short-time are recording equipment in the case of starting, and/or the component of an output can be adjusted continuously. In that case, only the output needed for starting after using all short-time are recording equipments completely is preferably taken out from long duration are recording equipment (claim 4). As mentioned above, it depends for an output required for starting on an internal combustion engine's temperature remarkably especially. Therefore, the magnitude of the output taken out from prolonged are recording equipment is controllable using a known temperature dependence function based on measurement of the temperature value at that time. By this configuration, the minimum short-time load of long duration are recording equipment is brought about.
In other desirable configurations, only the output of the amount needed for starting after using all long duration are recording equipments completely is taken out from short-time are recording equipment (claim 5). By it, it can use for other different purposes for starting of the component in which the max of the energy accumulated in short-time are recording equipment in each temperature is possible, and electric power can be supplied to other loads like the heater especially described in relation with claim 2 before starting (especially catalyst heater).
The output in which it is desirable and the max from long duration are recording equipment is possible is taken out (claim 6). It is obtained by giving a load by the adaptation for long duration are recording equipment with the optimal coupling circuit, i.e., the effective internal resistance of a coupling circuit being almost equal to the internal resistance of long duration are recording equipment. In the case of this adaptation, resistance between long duration are recording equipment and a coupling circuit is taken into consideration (that resistance is added to the input resistance of a

coupling circuit, or the internal resistance of long duration are recording equipment). This configuration assigns the comparatively big rate of full power to long duration are recording equipment, and makes it possible to design short-time are recording equipment in a comparatively small dimension by it. the modification of this configuration -- setting -- a part of predetermined output in which the max from long duration are recording equipment is possible -- for example, the part of 50 to 100% of range -- it is preferably taken out from 65 100% 90 to 100 of 75 to 100%, and the especially desirable output in which max is possible% of preferably.
Short-time are recording equipment operates preferably with the different, especially higher electrical-potential-difference level from long duration are recording equipment (claim 7). In that case, a coupling circuit has preferably the step up converter which can make a converter, for example, a current, the electrical-potential-difference level of another side from one electrical-potential-difference level. Various electrical-potential-difference levels can be fitted to the technical property that two different are recording device type differs preferably. That is, capacitor are recording equipment reaches the (setting to 300 volts) maximum energy storage device consistency in a comparatively high especially electrical-potential-difference level, and a battery dc-battery usually supplies the comparatively low electrical potential difference which is especially equivalent to the electrical potential difference of low-battery car electric system according to the number of the cels connected to the dc-battery type list used, respectively at the serial (for example, 12 volts or 24 volts). A coupling circuit is a step up converter for example, on the basis of an induction pump circuit. When this kind of thing consists of series circuits of an inductance and an electric switch and the switch is closed, the current from long duration are recording equipment flows through. Branching to the short-time are recording equipment which is in a high electrical-potential-difference level by between these two elements is prepared, and the diode which prevents a back flow to the branching is formed. disconnection of a switch -- induction -- an electrical-potential-difference peak (theoretically height of arbitration) -- generating -- it -- a current -- a short period of time -- a high electrical-potential-difference level -- a sink -- therefore, it steps up. By increasing or decreasing the switching frequency of a switch, the amount of currents which steps up can be increased thru/or decreased according to it.
Preferably, electric power is supplied to a starter by the inverter which has a direct-current-voltage intermediate circuit, and a short-time energy storage device is in the electrical-potential-difference level of a direct-current-voltage intermediate circuit in that case (claim 8). A direct-current-voltage intermediate-circuit inverter takes out the pulse which changed width of face with an electronic switch (for example, a field-effect transistor or IGBT's) from the intermediate-circuit direct current voltage currently maintained uniformly, for example, and serves as alternating current of the direct current by which the pulse was averaged by the inductance of a generator and the desired electrical potential difference was graduated mostly or a desired frequency, the amplitude, and a phase. Therefore, it is especially effective if the starter is formed as a polyphase current machine (it is also called a rotating-magnetic-field machine). Unlike a commutator machine, a polyphase current machine is especially a machine without a commutator, a stator generates a magnetic field, in it, 360 degrees of the magnetic field rotate, and it interlocks Rota. Especially a starter can be formed as an asynchronous machine which has for example, short circuit Rota, for example as a synchronous machine equipped with Rota which has a clear magnetic pole. Short circuit Rota in an asynchronous machine can be made into basket mold Rota which has a short circuit bar in shaft orientations. In other configurations of an asynchronous machine, Rota has a coil and can short-circuit the coil externally through the slip ring. The clear magnetic pole of Rota in a synchronous machine is realized by a permanent magnet or the electromagnet which can supply an exciting current through the slip ring. A starter is combinable with an internal combustion engine shaft through a pinion, a counter shaft, etc. indirectly. However, some starters, especially Rota are attached direct picking on an engine shaft, preferably, it is combined with the engine shaft so that relative rotation may not be carried out preferably, or it can join together. Rota can be attached on the shaft which leads to transmission, or can be attached on the axis end section which became the dead end and has finished it as the side other than an internal combustion engine there. It is combined or other parts of a starter, especially a stator can be combined so that relative rotation may not be carried out with the part which cannot be rotated, for example, engine housing, and a gearbox casing.

The polyphase current machine by which inverter control is carried out has the function of the equipment which graduates actively the rotation unevenness generated based on the discontinuous nature of the activity approach in the additional car drive motor and/or internal combustion engine as the generator for one or more desirable addition functions, for example, car electric system electric supply, and an additional car brake besides starter ability. Change control to the generator drive from motorised is performed by carrying out change control of the magnetic field according to it by suitable inverter drive.
This invention relates to the approach of starting an internal combustion engine again. About an advantage, starter system, its configuration, and **** about an operation gestalt and the below-mentioned explanation can be referred to in claim 9 and 10 lists at the description of the approach based on this invention, and a configuration list.
Next, this invention is explained to a detail using the rough drawing of attachment in an operation gestalt list. In a drawing Drawing 1 is a graph which shows the relative energy in which ejection is possible for a load as a function of temperature (the 1st view).;
Drawing 2 is a graph which shows the output component supplied from short-time are recording equipment and prolonged are recording equipment as a function of temperature (the 2nd view).;
Drawing 3 shows the most important functional unit of starter system roughly (the 1st and the 2nd view).;
Drawing 4 is the flow chart of the approach of starting (the 1st view).;
Drawing 5 is the flow chart of other approaches of starting (the 2nd view).
Drawing 1 explains the energy situation in the operation gestalt of the 1st view of this invention. The component eV which branches for the load of the energy accumulated into a capacitor is indicated as a function of an internal combustion engine's temperature. Component eV is defined as a ratio of the amount EV of energy which branches for a load, and the amount of total energy Etotal accumulated into the capacitor. In one extremal value Tmin, i.e., the lowest temperature to generate, the load energy component eV is equal to zero. In order to make it start, the total energy accumulated is needed, namely, starting energy component eStart/kalt is equal to 1. In the highest temperature Tmax, for example, an internal combustion engine's drive temperature, to generate, a part of energy accumulated is needed for starting, namely, starting energy component eStart/warm is much lower than 1. It can use in order to supply the remaining amount of energy to the load before starting here, namely, load energy component eV/warm is equal to the difference of 1 and eStart/warm. Drawing 1 shows eV roughly about all the values between Tmin and Tmax. since the resistance which an internal combustion engine rivals to a starter decreases with the rise of temperature and starting speed decreases, the dependency of illustration is constant -- and it is only the function (or fixed) going up.
Drawing 2 explains the output situation in the operation gestalt based on the 2nd view of this invention. Here, the full power needed in the case of starting (to predetermined torque sake) is indicated as a function of temperature. Full power is max in the lowest temperature Tmin to produce, and it decreases as temperature rises to the highest temperature Tmax. [as well as an above-mentioned configuration] It is the greatest output drawing of short-time are recording equipment which a broken line shows, and does not depend for the greatest output drawing on temperature. Therefore, it is a straight line level by a diagram. In the 2nd view of this invention, since short-time are recording equipment and a dc-battery collaborate in the case of starting, the maximum short-time are recording equipment output forms a kind of base lower than the maximum full power in the minimum temperature Tmin to produce therefore. Only in the temperature field to which a full power curve crosses this base (a slash shows), energy is taken out from a dc-battery. This is illustrated by drawing 2 about the upper temperature of Tmin. In average temperature, the curve of full power is less than the base. That is, in temperature higher than an intersection, starting is performed only from short-time are recording equipment, and a dc-battery is not contributed here. (not shown) others -- since the maximum short-time are recording equipment output may be less than required full power also in Tmax at the time, a dc-battery needs to be contributed in that case. In other operation (not shown) gestalten, since the maximum short-time storage equipment output is lower than required full power [in / by all times / Tmax], a dc-battery contributes to starting at all the times.

Starter system has an internal combustion engine 1, as shown in drawing 3 (an automobile, for example, for passenger cars), and the internal combustion engine outputs torque to the driving wheel of a car through other parts (not shown) of a driving shaft (for example, an internal combustion engine's 1 crankshaft), a clutch 3, and the drive train. In the starter ability which attracts interest here, the clutch 3 is opened wide. On the driving shaft 2, the asynchronous polyphase current machine is attached the electric machine 4 used as a starter, and here. An electric machine has the stator 6 supported by an internal combustion engine's 1 housing in the Rota 5 list combined so that it might be attached on the direct-drive shaft 2 and relative rotation might not be carried out with the driving shaft. the starter 4 (equipment for carrying out energy supply at the electric supply list of a starter explained to a list below at a detail) is designed by the dimension which can put an internal combustion engine 1 into operation directly (namely, a fly wheel function etc. -- nothing) preferably, and since accelerating or a moderation means is not preferably arranged between the starter 4 and the internal combustion engine 1, either, both can rotate it together everlastingly. The current and electrical potential difference of a frequency are supplied to the coil (not shown) of a stator 6 with an inverter 7 by the amplitude and phase list which can actually be adjusted freely. an inverter is for example, a direct-current-voltage-intermediate-circuit inverter, takes out the pulse which changed width of face with an electronic switch from the intermediate-circuit direct current voltage of about 1 law, and the pulse averages it with the inductance of the electric machine 4 -- having -- a desired frequency and an amplitude list -- a phase -- it becomes the current of a sign configuration mostly. The inverter is constituted from direct-current-voltage converter 7c by the side of car electric system by direct-current-voltage-alternating-voltage converter 7a by the side of a machine, and the intermediate-circuit 7b list in most. Short-time are recording equipment 8, for example, capacitor are recording equipment, is seen electrically, and it is formed in intermediate-circuit 7b. & Transducer 7c is combined with the car electric system dc-battery 10 the car electric system 9, long duration are recording equipment, and here. The car electric system 9 and a dc-battery 10 are connected to a low electrical-potential-difference level, 12 [for example,], or 24 volts. Intermediate-circuit 7b is preferably connected to the electrical potential difference to which the range of 48 to 350 volts was raised to it. The electric machine 4 can supply functioning as a generator, i.e., electric energy, after the starting process which needs electric energy.

Therefore, converter 7c is formed as a congruence directional change machine, and can move the electric energy for preparation of starting-process-less **** to intermediate-circuit 7b from the car electric system dc-battery 10 by one side by it. In a generator drive, energy can be moved from intermediate-circuit 7b to a low-battery side on the other hand, and electric power can be supplied to the load of the car electric system 9 by it, and the car electric system dc-battery 10 can be charged. Converter 7a changes the direct current voltage of intermediate-circuit 7b into alternating voltage in motorised, and after rectifying the energy supplied from the electric machine 4 in a generator drive, it supplies it to intermediate-circuit 7b. Capacitor are recording equipment 8 can supply an electrical-potential-difference pulse by steep nature required for a high pulse frequency (preferably the range of 20 to 100kHz). Further, this capacitor are recording equipment collaborates with a dc-battery 10 if needed, and is used as an energy storage device which accumulates energy required for starting. In other operation (not shown) gestalten, in order to prepare a steep pulse, the capacitor are recording equipment of another object which can charge a high speed especially is formed, and it uses only a slight capacity. Charge of capacitor are recording equipment 8 can be performed through converter 7c from a dc-battery 10, when the electric machine 4 or the car has stopped through converter 7a for example, in a generator drive. The high power load 11, for example, electric catalyst heating apparatus, is electrically connected with intermediate-circuit 7b through the load control unit 12. Electric supply of the high power load 11 is a desirable high electrical-potential-difference level, for example, is performed with the electrical-potential-difference level of intermediate-circuit 7b. In that case, the load control unit 12 is used only not as a converter but as a current control unit. In other operation gestalten, a load control unit has a function as a converter to a further more high electrical potential difference or a lower electrical potential difference. The control device 13 arranged at the high order is an inverter 7, especially controls converter 7a and converter 7c, and the load control device 12. The amplitude, phase, and frequency of the polyphase current current which should be supplied to a starter 4 are set as converter 7a. The magnitude of electrical-potential-difference step-

up thru/or a step down is set as the magnitude of a current, and a flow direction list at converter 7c. And it is set up of which magnitude the load control unit 12 should take out a current from intermediate-circuit 7b and whether that kind of electrical-potential-difference difference should be conquered if needed in that case. A control unit 13 receives an input signal from the temperature sensor 14 which supplies the information about an internal combustion engine's 1 cooling agent temperature. Further, a control unit can receive an input signal from an angle-of-rotation (not shown) sensor, and can ask for the present rotational frequency of a driving shaft 2 based on the input signal. Furthermore, a control unit can acquire other information of a series of about a location [of an internal combustion engine's 1 throttle valve], and ignition time etc.
Next, it explains using the flow chart which shows the function of the starter system of drawing 3 based on the 1st view of this invention to drawing 4 . Capacitor are recording equipment 8 is charged in step S1. Charge is carried out to the value which is set up with the desired value of for example, an intermediate-circuit electrical potential difference and to which immobilization was set beforehand. According to possibility, charge of capacitor are recording equipment 8 is already performed from the electric machine 4 which is functioning as a generator in that case, when the internal combustion engine is rotating. However, since capacitor are recording equipment 8 discharges gradually when the idle state of a car is comparatively long, it must charge partially in that case all or by taking out energy from the car electric system dc-battery 10. In step S2, a control unit 13 searches for an internal combustion engine's current temperature using the measurement information supplied from a temperature sensor 14. In step S3, a control unit 13 calculates the amount of energy needed for starting called for in prediction in the temperature searched for at the step to precede using the map stored, for example. Based on the known value of the calculated required amount of energy, and the amount of energy accumulated in capacitor are recording equipment, a control device asks for the part which is not needed in the current temperature of the energy accumulated in capacitor are recording equipment 8 for starting in step S4. In step S5, a control unit 13 asks whether the command which starts an internal combustion engine by actuation of an ignition key was given. In not making it start, a control unit 13 repeats and performs S5 from step S2. When a starting command is given to it, it progresses to the following step S6. (not shown) others -- in an operation gestalt, a program is in a passive standby condition. After obtaining a starting command, action based on step S2 and S4 is carried out for the first time there. the part by which, as for a control unit 13, energy is not needed for a catalyst heater in step S6 the high power load 11 and here -- short-time ****** -- a high output is supplied. By it, immediately, a catalyst becomes drive temperature and preparation of material conversion of harmful exhaust gas already completes it in the case of the first ignition by it. And in step S7, an internal combustion engine 1 uses the energy part which remains to capacitor are recording equipment 8, and starts.
The flow chart shown in drawing 5 explains the modification of the functional approach of the starting system of drawing 3 based on the 2nd view of this invention. Being able to refer to the explanation which steps S1, S2, and S3 mentioned above about steps S11, S12, and S13, those steps correspond about the whole contents also here. At step S14, a list is asked for the energy component which must be taken out from capacitor are recording equipment in the present temperature of the car electric system dc-battery 10 for a starting process based on the known value of the amount of energy accumulated in capacitor are recording equipment 8 as a result of step S13. At step S15, like the explanation mentioned above about step S5, the starting command is given or ** is asked. (Also in this operation gestalt, a starting command inquiry can be performed, before carrying out steps S12, S13, and S14.) And in step S16, according to the component for which it asked at step S14, a control device 13 takes out energy from the car electric system dc-battery 10 if needed, and starts an internal combustion engine 1 from capacitor are recording equipment 8. In other operation (not shown) gestalten, in advance of a starting process, repeat operation of steps S14 and S16 is often carried out, and when time delay of the energy component which should be taken out by it while a starting process is going on exists, the delay is also taken into consideration. This kind of time dependency may be produced, when capacitor are recording equipment 8 cannot discharge while a charge process is going on, only slight energy can be supplied the back near the last of that discharge process but the component which should be taken out from the car electric system dc-battery 10 by that cause increases. Therefore, in the temperature which exists in step S14 in this operation gestalt,

if it thinks strictly, when it corresponds under advance of a starting process, the output component which must be taken out from the car electric system dc-battery 10 will be called for. At step S16, appropriate output ejection is performed from a capacitor and a dc-battery according to the output component called for at step S14 after that.
Therefore, an epitome bases this invention on the idea of taking into consideration the temperature dependence of the amount of energy required for starting regardless of the time of charge of short-time storage equipment in the case of discharge and/or a starting process. This is effective for the level as which short-time are recording equipment was beforehand determined in electrical potential difference especially for the starter system which must be in the level of the intermediate circuit of the inverter used for electric supply of a starter.

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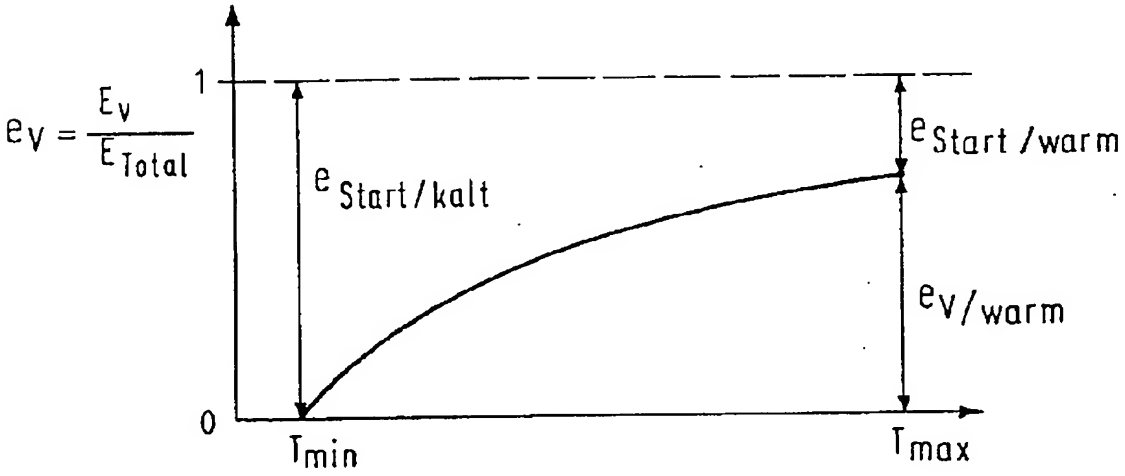
DRAWINGS

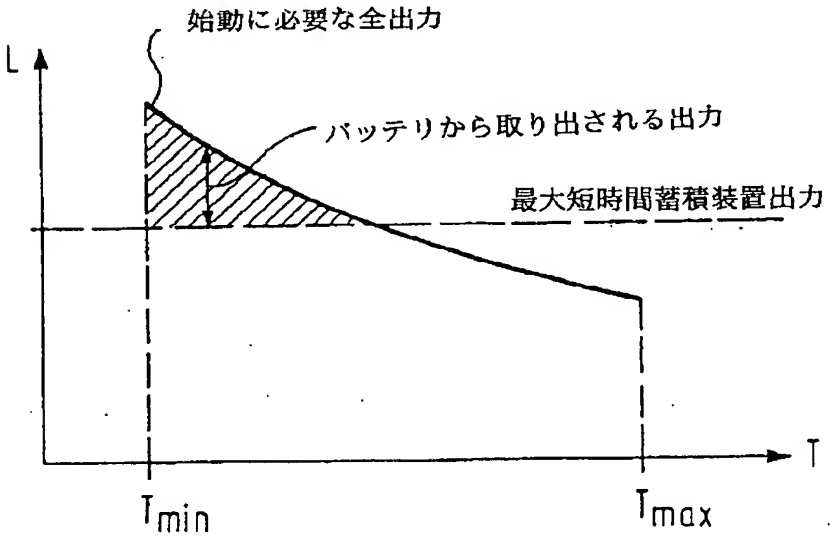
[Drawing 1]

Fig. 1



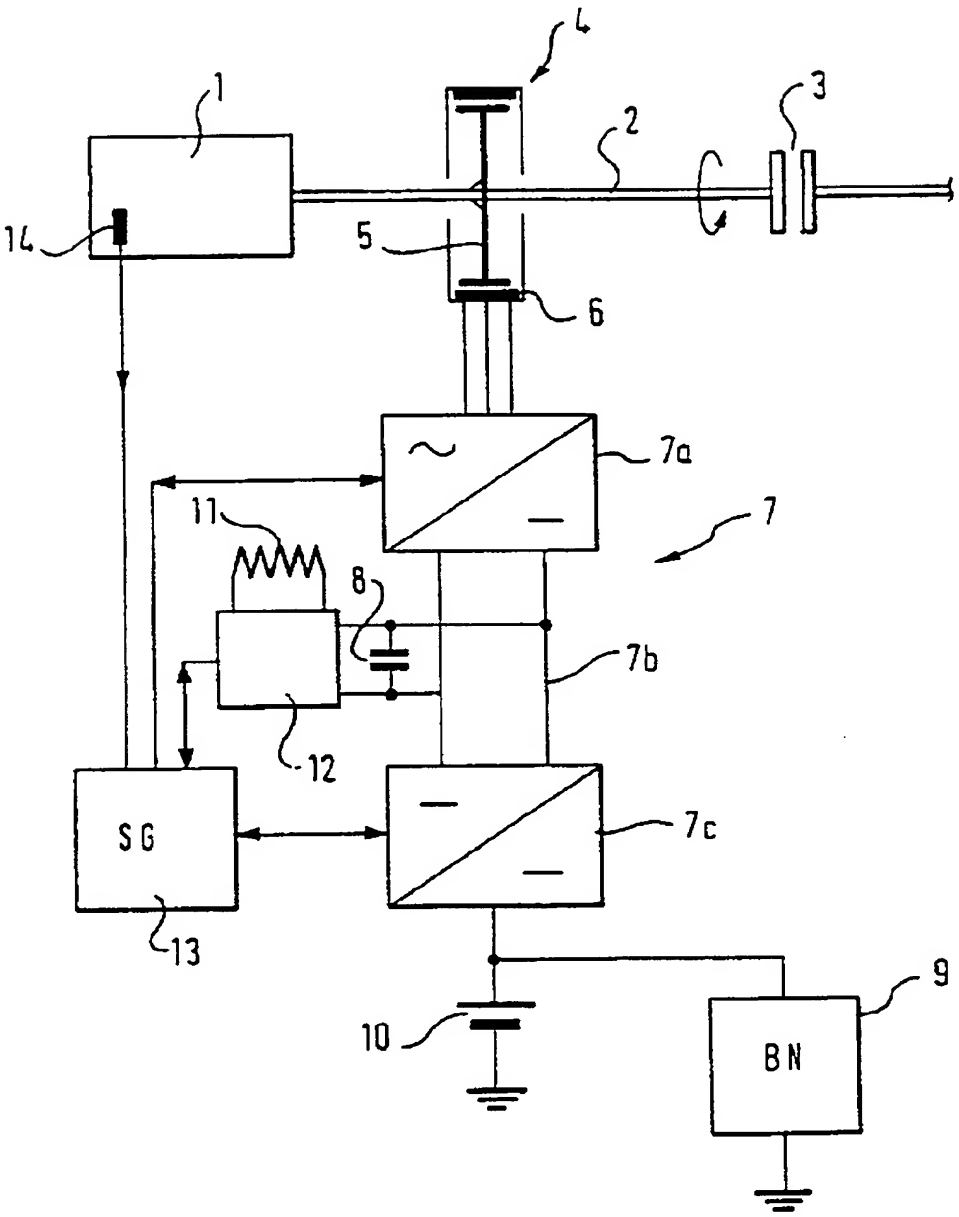
[Drawing 2]

Fig. 2



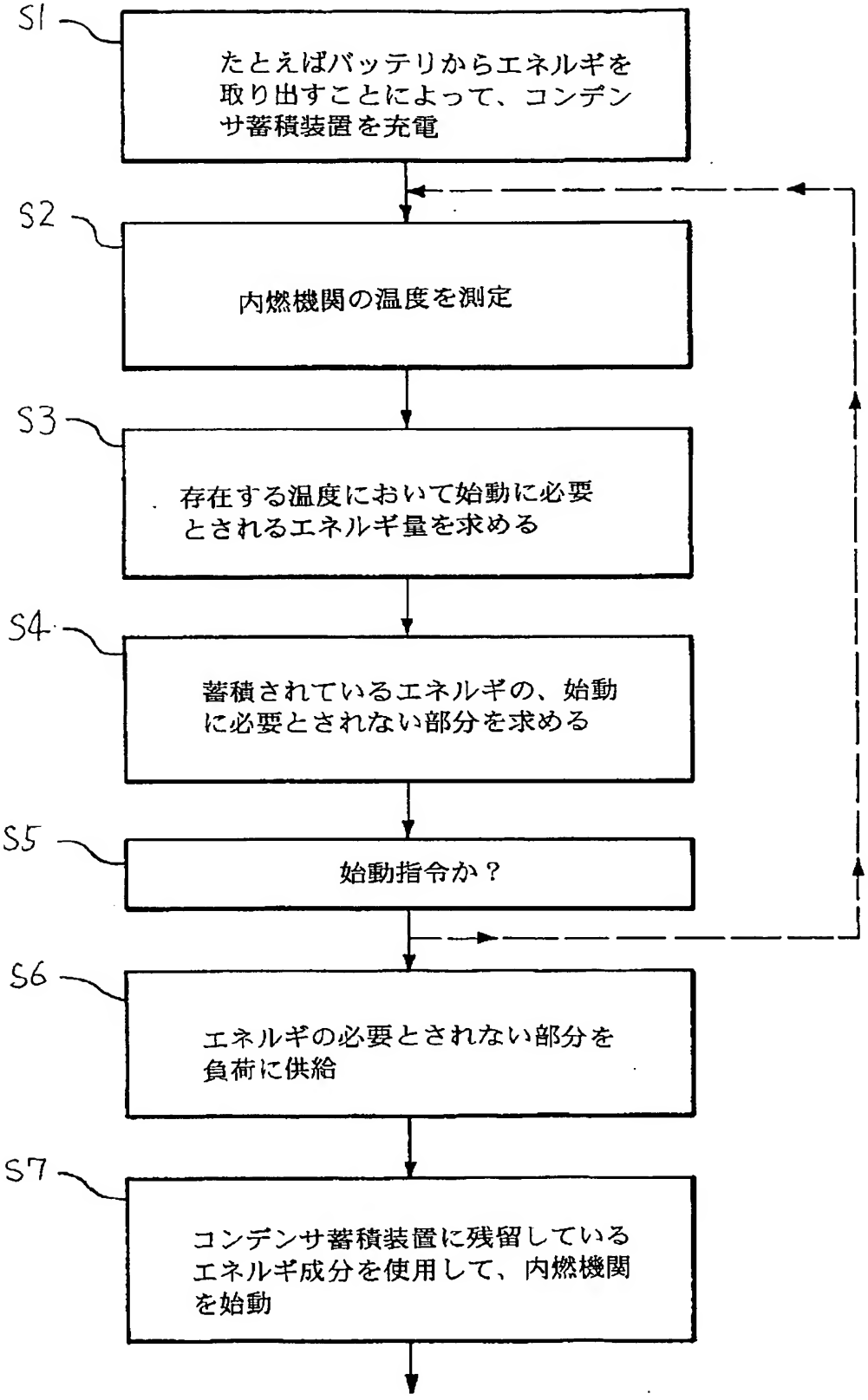
[Drawing 3]

Fig. 3



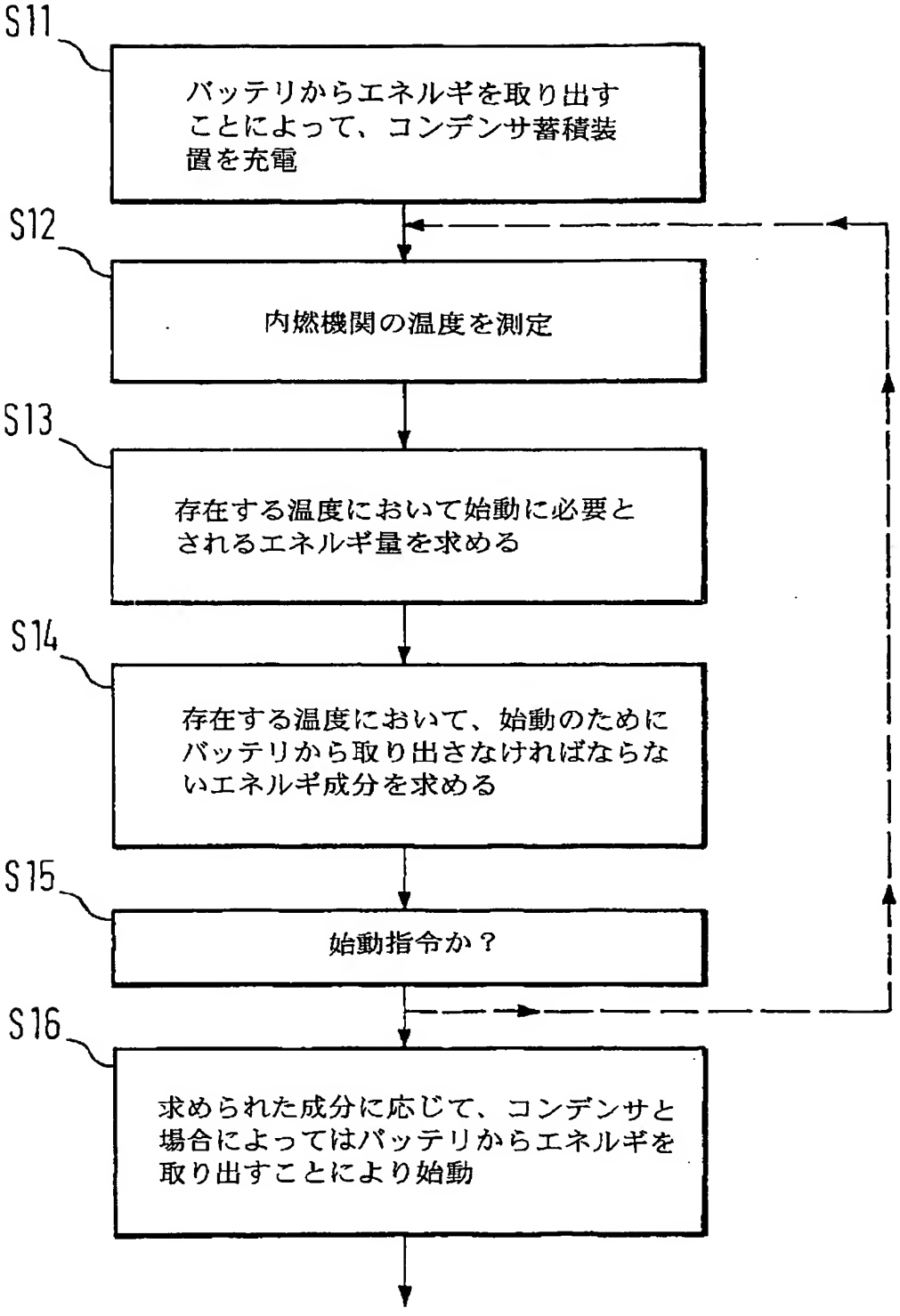
[Drawing 4]

Fig. 4



[Drawing 5]

Fig. 5



[Translation done.]